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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/652,323	08/29/2003	Deirdre H. Elqaq	30320/P15128	1631

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EXAMINER	
ANGEBRANNDT, MARTIN J	

ART UNIT	PAPER NUMBER
1756	

DATE MAILED: 07/12/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/652,323	ELQAQ ET AL.	
	Examiner	Art Unit	
	Martin J. Angebranndt	1756	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *28 April 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-18* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-18* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

1. The response of the applicant has been read and given careful consideration. Response to the arguments are presented after the first rejection to which they are directed

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1,8-10, and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kalbitzer et al. '432, in view of Kusunoki et al. '904.

Kalbitzer et al. '432 teaches the formation of a photomask by providing a substrate with a thin layer of crystalline silicon coated upon it and the use of ion bombardment using a focused ion beam to transform potions into the amorphous state. The use of ions of more than about 30 A.U. is described (3/28-4/19). The formation of masks having grating patterns and the like is described. (4/51-63).

Kusunoki et al. '904 teaches the formation of a resist pattern atop a silicon substrate, where ion beams of Si (28 A.U.) or Ge are irradiated and the photoresist acts as a mask, allowing the ions to reach the Si substrate only in the uncovered areas. In the uncovered areas, the silicon is changed to the amorphous state. The resist is then removed. The is described as an alternative to using focused (converging) beams (11/31-39)

It would have been obvious to modify the process of forming the photo mask taught by Kalbitzer et al. '432 by using the resist masking process taught by Kusunoki et al. '904 in place of the focused ion beam writing process with a reasonable expectation of forming a useful photomask based upon the disclosure of equivalence by Kusunoki et al. '904.

A photomask is an optical device.

The applicant's position fails to appreciate that the modification to the primary reference (Kalbitzer et al. '432) is suggested by the secondary reference which provides not only motivation, but an reasonable expectation of success to one of ordinary skill in the art. Clearly within the ion implantation art, the two references are within the lithographic arts (ion beams exposure not properly being photolithography) While the applicant is correct that Kalbitzer et al. '432 uses heavier ions, the ability of Si ions to perform the amorphization is disclosed within Kusunoki et al. '904 and clearly would not contaminate the layer with other atoms. Further, the teachings of the equivalence of Ge (72.8 AU) and Si (28.1 AU) in causing the amorphization is established by Kusunoki et al. '904. The rejection stands.

4. Claims 1-3,6-10, and 14-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Strain '299, in view of Kalnitsky et al. '774.

Strain '299 teaches a silicon substrate which is oxidized to form a thin oxide layer, followed by a silicon nitride coating. An opening is formed in the nitride layer, followed by the use of a second photoresist mask to pattern the oxide film. Then ion implantation is used to dope the silicon layer. The use of boron, germanium, arsenic or phosphorous is disclosed. The oxide is then removed back to the patterned nitride and oxide growth in the exposed silicon is promoted. In the intermediate article, the doping is into silicon, which is later oxidized to form a doped silicon dioxide waveguiding region (2/38-3/24). The resist may be left in place during the ion implantation (4/ 20-24).

Kalnitsky et al. '774 teaches a silicon substrate which is oxidized, provided with a silicon nitride layer, which acts as an ion implantation mask, to facilitate selective implantation of Si

ions into the silicon oxide layer. (3/12-36). The results in a waveguiding region where the refractive index is higher than the surrounding silicon dioxide layer.

It would have been obvious to modify the process of forming a waveguide taught by Strain '299 by using Si ion doping as taught by Kalnitsky et al. '774 with a reasonable expectation of forming a useful waveguide based upon the teachings of Kalnitsky et al. '774.

The examiner notes that the applicant did not attempt to claim the embodiment of figure 2.

The applicant argues that Kalnitsky et al. '774 discusses Strain '299 and speaks to correct problems discussed within that reference and in the next breath argues that they are not combinable and that there is not motivation to combine them. (reply at page 5). The response also neglect the evidence that either doping results in the reflective index which confers the ability to act as a waveguide. (ie. dense to rare transitions can be totally internally reflecting). Further both references being the waveguiding field makes them analogeous as do the admitted relation between the references. The rejection stands.

5. Claims 1-10, and 14-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Strain '299, in view of Kalnitsky et al. '774 and Kase et al. '794.

Kase et al. '794 teach doping with crystalline silicon with Ge or Si to preamorphize the crystalline silicon, so that when boron, phosphorous or arsenic dopants are implanted, ion channeling is minimized and the implant profile is not broadened by diffusion of the second dopant. (1/47-66, 2/52-60).

It would have been obvious to modify the process of forming a waveguide taught by Strain '299 by using Si ion doping first as taught by Kase et al. '794 to form preamorphized

regions followed by the boron, arsenic or phosphorous dopants to control diffusion with a reasonable expectation of being able to useful waveguide having a region doped with Si based upon the teachings of Kalnitsky et al. '774.

The applicants's position ignores that fact that pattern accuracy would be desirable in all of the applied references and so the preamorphization is desirable and would be considered analogous art.

6. Claims 1-11, and 14-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Strain '299, in view of Kalnitsky et al. '774 and Kase et al. '794, further in view of Koblinger et al. '317 and Coronel et al. '585.

Koblinger et al. '317 teach etching silicon dioxide and nitrides using a photoresist mask and CF_4, CHF_3 and the like is disclosed. (1/46-62).

Coronel et al. '585 teaches silicon nitride as a ion implantation mask for boron, where CF_4/ CHF_3/Ar is used to etch the areas not covered by the photoresist.

In addition to the basis provided above, the examiner holds that it would have been obvious to modify the processes rendered obvious by the combination of Strain '299, Kalnitsky et al. '774 and Kase et al. '794 by using known etchings processes, for silicon oxide and silicon nitride ion masking materials, such as those based upon CF_4, CHF_3 and/or Ar taught by Koblinger et al. '317 and Coronel et al. '585 as useful in etching silicon nitride and silicon dioxide with a reasonable expectation of being able to pattern these ion masking layers.

The rejection stands for the reasons above as no further arguments were directed at this rejection.

7. Claims 1-2,7-10, and 14-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dood et al. "amorphous silicon waveguides for microphotonics", J. Appl. Phys. Vol. 92(2) pp, 649-653, in view of Kusunoki et al. '904.

Dood et al. "amorphous silicon waveguides for microphotonics", J. Appl. Phys. Vol. 92(2) pp, 649-653 teach a crystalline silicon layer formed upon a silicon dioxide substrate, which is subjected to a masked irradiation using Xe ions to form a triangular shaped amorphous silicon region (see figure 4), followed by a resist patterning and masking etching down to the silicon dioxide to form ribs of silicon. (Section III).

It would have been obvious to modify the process of forming the photo mask taught by Dood et al. "amorphous silicon waveguides for microphotonics", J. Appl. Phys. Vol. 92(2) pp, 649-653 by using the resist masking process and the silicon implantation/bombardment taught by Kusunoki et al. '904 with a reasonable expectation of forming a useful waveguide based upon the disclosure of amorphization using silicon implantation by Kusunoki et al. '904.

The arguments of the applicant fails to appreciate that the amorphization of the silicon layer by implantation of silicon or Xe ions is of record in the references and therefore confers a reasonable expectation of success to one skilled in the art. They are evidenced in the art to have the same effect and both are ion implantation processes. The applicant is invited to show comparative data commensurate with the scope of coverage sought.

8. Claims 1-3 and 6-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dood et al. "amorphous silicon waveguides for microphotonics", J. Appl. Phys. Vol. 92(2) pp, 649-653 and Kusunoki et al. '904, in view of Strain '299, Kalnitsky et al. '774 and Kase et al. '794.

In addition to the basis provided above, the examiner holds that it would have been obvious to modify the processes rendered obvious by the combination of Dood et al. "amorphous silicon waveguides for microphotonics", J. Appl. Phys. Vol. 92(2) pp, 649-653 and Kusunoki et al. '904 by using Si ion doping first as taught by Kase et al. '794 to form preamorphized regions followed by the boron, arsenic or phosphorous dopants to control diffusion with a reasonable expectation of being able to useful waveguide having a region doped with Si based upon the teachings of Kalnitsky et al. '774 and the boron, arsenic or phosphorous dopants disclosed by Strain '299.

The rejection stands for the reasons above as no further arguments were directed at this rejection.

9. Claims 1-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dood et al. "amorphous silicon waveguides for microphotonics", J. Appl. Phys. Vol. 92(2) pp, 649-653, Kusunoki et al. '904, Strain '299, Kalnitsky et al. '774 and Kase et al. '794, further in view of Koblinger et al. '317 and Coronel et al. '585.

In addition to the basis provided above, the examiner holds that it would have been obvious to modify the processes rendered obvious by the combination of Dood et al. "amorphous silicon waveguides for microphotonics", J. Appl. Phys. Vol. 92(2) pp, 649-653, Kusunoki et al. '904, Strain '299, Kalnitsky et al. '774 and Kase et al. '794 by using known etchings processes, for silicon oxide and silicon nitride ion masking materials, such as those based upon CF_4, CHF_3 and/or Ar taught by Koblinger et al. '317 and Coronel et al. '585 as useful in etching silicon nitride and silicon dioxide with a reasonable expectation of being able to pattern these ion masking layers.

The rejection stands for the reasons above as no further arguments were directed at this rejection.

10. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Martin J. Angebranndt whose telephone number is 571-272-1378. The examiner can normally be reached on Monday-Thursday and alternate Fridays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Huff can be reached on 571-272-1385. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Martin J Angebranndt
Primary Examiner
Art Unit 1756

01/26/2006